"Result window" shows the cartilage information with gray (or color) intensity over the 3D bone shape. The developed program can display and save color DICOM MRI as shown in Fig. 2, and provide the statistical information (Mean, Min, Max of thickness and Volume) of the local VOI of "Lateral Condyle" and "Medial Condyle" as shown in the figures.

Conclusions: This paper proposes fully automatic cartilage segmentation and measurement method without any training process. The proposed method can visualize the whole cartilage distribution with the 3D bone shape. The experimental results demonstrate that it can be used for inspecting cartilage damage or loss directly. The developed software is therefore applicable in clinical knee OA diagnosis systems. Future studies include more tests with new MRI data for confirming the accuracy of the measurements.(Acknowledgment: This study was supported by a grant of the Korean Health Technology R&D project, Ministry for Health, Welfare & Family Affairs, and Republic of Korea. (A091120))

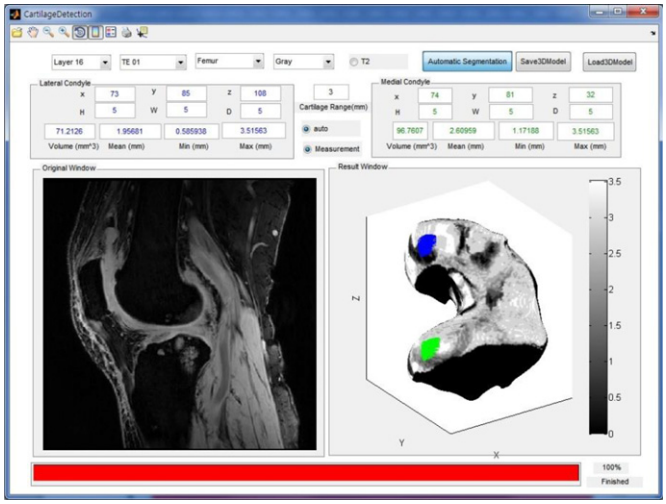

Fig. 1. Cartilage segmentation and measuring software for diagnosis of knee OA (gray).

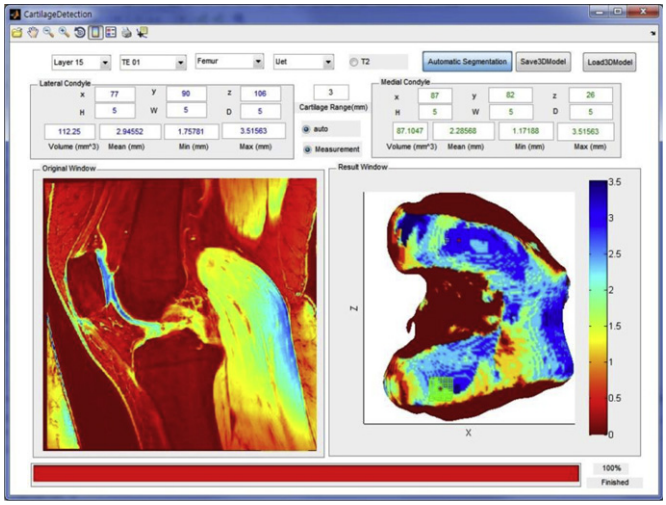

Fig. 2. Cartilage segmentation and measuring software for diagnosis of knee OA (color).

440
LITHIUM CHLORIDE - A NOVEL TREATMENT FOR OSTEOARTHRITIS?

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Purpose: Lithium chloride (LiCl) is currently being used for the treatment of bipolar disorder because of its ability to interact with various receptors and affect major signaling pathways. In addition, it has been suggested that LiCl may inhibit matrix metalloprotease (MMP) expression in interleukin (IL)-1-treated articular chondrocytes. Based on its ability to modulate signaling pathways, we hypothesized that LiCl inhibits cartilage degradation during osteoarthritis (OA). Therefore, the purpose of this study was to determine the effects and mechanism of action of LiCl on cartilage degradation during OA.

Methods: The expression of catabolic genes and the activation of NF-κB in mouse and human articular chondrocytes cultured in the absence or presence of 10ng / ml IL-1, 50ng / ml IL-6, 10mM LiCl, and 10μM glycogen synthase kinase 3 (GSK-3) inhibitor SB-216763 (SB) were determined by real time PCR and luciferase reporter assays. Cell lysates from chondrocytes treated with IL-1, IL-1 / LiCl, or IL-1 / SB were analyzed for mitogen activated protein kinase (MAPK) and signal transducer and activator of transcription 3 (STAT3) activities by immunoblotting. Cartilage degradation in mouse femoral head explants cultured in the absence or presence of IL-1, LiCl and SB was determined by safranin O staining, and measuring the release of glycosaminoglycan (GAG) and IL-6 into the culture media by ELISA. Cartilage degradation in a post-traumatic OA mouse model using the transection of the medial collateral ligament and partial medial meniscetomy (PMX) after treatment with vehicle or LiCl (weekly intraarticular injections for 8 weeks) was analyzed histologically by toluidine blue staining.

Results: Cartilage degradation was markedly reduced in LiCl-treated mice 8 weeks after PMX surgery compared with vehicle-treated mice despite the fact that Li+ as a potent inhibitor of GSK-3 stimulates Wnt/β-catenin signaling, a well-known signaling pathway that stimulates cartilage degradation in surgical-induced mouse OA models. To determine the mechanisms of how LiCl protects articular cartilage against degradation, we determined the effects of LiCl and the GSK-3 inhibitor (SB) on catabolic events in IL-1-treated mouse articular chondrocytes. Treatment with LiCl, but not SB, resulted in decreased mRNA levels of catabolic markers, including ADAMTS-5, COX-2, IL-6, iNOS, and MMP-13, in articular chondrocytes treated with IL-1. LiCl markedly reduced the proteoglycan loss and the release of IL-6 in IL-1-treated mouse articular chondrocytes or femoral head explants, whereas SB further increased proteoglycan loss and IL-6 release in IL-1-treated chondrocytes or explants. LiCl treatment markedly reduced NF-κB and p38 MAPK signaling activities in IL-1-treated chondrocytes. As a consequence of reduced IL-6 expression in LiCl and IL-1-treated chondrocytes, LiCl markedly reduced Jak/STAT3 signaling activity in IL-1-treated chondrocytes. LiCl directly reduced Jak/STAT3 signaling activity in IL-6-treated articular chondrocytes.

Conclusion: LiCl protects articular cartilage against degradation during OA via the inhibition of major signaling pathways involved in OA pathology, including NF-κB, p38 MAPK and STAT3 signaling. Our findings suggest that LiCl as a modulator of the activities of major signaling pathways involved in OA pathology may act as novel compound for the treatment of OA. The advantage of LiCl as a potential novel compound for the treatment of OA is that LiCl is already approved for the treatment of patients with bipolar disorders.

441
UTILIZATION OF HIGH THROUGHPUT MECHANICAL SCREENING FOR THE EVALUATION OF MECHANICAL PROPERTIES AND COMPRESSIVE INJURY MODELS

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Purpose: Restoration of cartilage after damage remains a perplexing clinical issue. High throughput (HT) assays enable rapid screening of chemical libraries for the discovery of novel compounds relevant to tissue development and healing. For musculoskeletal tissue engineering applications, HT technologies should also enable measurement of construct mechanical properties, as the success of these repair therapies will likely depend on their mechanical functionality. Similarly, given the mechanical origin of certain diseases, such as post-traumatic osteoarthritis (PTOA), HT methods for mechanical perturbation of numerous constructs might prove beneficial for the identifying novel factors that modulate disease progression. Here we demonstrate that a novel HT mechanical screening (HTMS) device can enable measurement of compressive mechanical properties of biomaterials and induce reproducible injury in engineered cartilage in a HT manner.

Methods: HTMS Testing of Hydrogels: 15% polyacrylamide (PA) and 4% agarose (Ag) gels (Ø:4mm,H:2.25mm; n=24/material) were tested using a step-compression protocol in the 48 well device. Gels were compressed to 10% strain over 200s and held for 1000s per step, for